

This listing of claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS:

Claim 1 (Original): An XML data encoding method comprising the steps of:

converting into ASN.1 abstract syntax type a grammar definition for defining the grammar of XML data;

separating said XML data into the contents text of a syntactic element and a structure an element name including the structure;

converting said structure into an ASN.1 abstract syntax value that conforms to said ASN.1 abstract syntax type;

converting said ASN.1 abstract syntax value into an ASN.1 transfer syntax;

compressing said contents of said syntactic element; and

combining the compressed contents of said syntactic element and said ASN.1 transfer syntax.

Claim 2 (Original): An XML data encoding method according to claim 1, wherein said grammar definition includes an attribute, a process instruction and a grammar definition entry other than said syntactic element,

further comprising the steps of:

converting said grammar definition into a different grammar definition, so that said grammar definition entry other than said syntactic element is included in said syntactic element as a special element; and

converting said XML data into different XML data in conformation with said different grammar definition.

Claim 3 (Previously Presented): An XML data encoding method according to claim 1, wherein said grammar definition is a DTD, the element contents include operators selected from among: ",", "|", "?", "*" and "+", no operator, any combination of these operators; and wherein for said ASN.1 abstract syntax type, said "," operator is represented by a "sequence" type, said "|" operator is represented by a "choice" type, said "?" operator is represented by a combination of a "sequence" type and a keyword "OPTIONAL", said "*" operator is represented by a "sequence-of" type, said "+" operator is represented by a "sequence-of" type having a limited size, and a case wherein none of said operators is present is represented by a "defined" type.

Claim 4 (Original): An XML data encoding method according to claim 3, wherein at said step of converting said grammar definition into said different grammar definition, an attribute included in said grammar definition is represented as an attribute element that can be uniquely determined, and is handled as the child element of a parent element of said attribute; the attribute value of said attribute is regarded as CDATA and is handled as the child element of said attribute element; when said attribute is "REQUIRED", said attribute element is represented by a syntactic element; when said attribute is "IMPLIED", and/or when a default value is defined as said attribute, said attribute element is represented by an element for which said "?" operator is employed, and wherein at said step of converting said XML data into different XML data, an attribute included in said syntactic element of said XML data is represented as an attribute

element that can be uniquely determined, and is handled as the child element of a parent element of said attribute.

Claim 5 (Previously Presented): An XML data encoding method according to claim 1, wherein said step of converting said ASN.1 abstract syntax value into said ASN.1 transfer syntax comprises employing PER rules.

Claim 6 (Original): A method for decoding encoded XML data comprising the steps of:

converting a grammar definition for defining the grammar of XML data into ASN.1 abstract syntax type;

separating encoded XML data into an ASN.1 transfer syntax and the contents text of a compressed syntactic element;

converting said ASN.1 transfer syntax into an ASN.1 abstract syntax value that conforms to said ASN.1 abstract syntax type;

converting said ASN.1 abstract syntax value into the structure of XML data that conforms to said grammar definition;

decompressing said contents of said compressed syntactic element; and

combining the decompressed contents of said syntactic element and said structure of said XML data.

Claim 7 (Original): A method according to claim 6, wherein said grammar definition includes an attribute, a process instruction and a grammar definition entry other than said syntactic element, further comprising the steps of:

converting said grammar definition into a different grammar definition, so that said grammar definition entry other than said syntactic element is included in said syntactic element as a special element; and

converting said decoded XML data into different XML data in conformation with said different grammar definition.

Claim 8 (Original): A method according to claim 6, wherein said grammar definition is a DTD, the element contents of which include operators selected from among: ",", "|", "?", "*" and "+", no operator, any combination of these operators; and wherein for said ASN.1 abstract syntax type, said "," operator is represented by a "sequence" type, said "|" operator is represented by a "choice" type, said "?" operator is represented by a combination of a "sequence" type and a keyword "OPTIONAL", said "*" operator is represented by a "sequence-of" type, said "+" operator is represented by a "sequence-of" type having a limited size, and a case wherein none of said operators is present is represented by a "defined" type.

Claim 9 (Original): A method according to claim 8, wherein at said step of converting said grammar definition into a different grammar definition, an attribute included in said grammar definition is represented as an attribute element that can be uniquely determined, and is handled as the child element of a parent element of said attribute; the attribute value of said attribute is regarded as CDATA and is handled as the child element of said attribute element; said attribute element is represented by a syntactic element when said attribute is "REQUIRED"; said attribute element is represented by an element for which said "?" operator is employed when said attribute is "IMPLIED" and/or when a default value is defined as said attribute, and wherein at said step of

converting said decoded XML data into different XML data, said attribute element that is included as said child element in said syntactic element of said decoded XML data is converted into the attribute of said syntactic element and/or the attribute value thereof.

Claim 10 (Previously Presented): A method according to claim 6, wherein at said step of converting said ASN.1 transfer syntax into said ASN.1 abstract syntax value comprises employing PER rules.

Claim 11 (Original): An XML data encoding system comprising:

- means for converting into ASN.1 abstract syntax type a grammar definition for defining the grammar of XML data;

- means for separating said XML data into the contents text of a syntactic element and an element name including the structure;

- means for converting said structure into an ASN.1 abstract syntax value that conforms to said ASN.1 abstract syntax type;

- means for converting said ASN.1 abstract syntax value into an ASN.1 transfer syntax;

- means for compressing said contents of said syntactic element; and

- means for combining the compressed contents of said syntactic element and said ASN.1 transfer syntax.

Claim 12 (Original): An XML data encoding system according to claim 11, wherein said grammar definition includes an attribute, a process instruction and a grammar definition entry other than said syntactic element,

further comprising:

means for converting said grammar definition into a different grammar definition, so that said grammar definition entry other than said syntactic element is included in said syntactic element as a special element; and

means for converting said XML data into different XML data in conformation with said different grammar definition.

Claim 13 (Original): An XML data encoding system according to claim 11, wherein said grammar definition is a DTD, the element contents of which include operators selected from among: ",", "|", "?", "*" and "+", no operator, any combination of these operators; and wherein for said ASN.1 abstract syntax type, said "," operator is represented by a "sequence" type, said "|" operator is represented by a "choice" type, said "?" operator is represented by a combination of a "sequence" type and a keyword "OPTIONAL", said "*" operator is represented by a "sequence-of" type, said "+" operator is represented by a "sequence-of" type having a limited size, and a case wherein none of said operators is present is represented by a "defined" type.

Claim 14 (Original): An XML data encoding system according to claim 13, wherein said means, for converting said grammar definition into said different grammar definition, represents an attribute included in said grammar definition as an attribute element that can be uniquely determined, and handles said attribute as the child element of a parent element of said attribute; regards the attribute value of said attribute as CDATA and handles said attribute value as the child element of said attribute element; represents said attribute element by a syntactic element when said attribute is "REQUIRED"; and represents said attribute element by an element for

which said "?" operator is employed when said attribute is "IMPLIED", and/or when a default value is defined as said attribute, and wherein said means, for converting said XML data into different XML data, represents an attribute included in said syntactic element of said XML data as an attribute element that can be uniquely determined, and handles said attribute as the child element of a parent element of said attribute. It should be noted that a case is excepted wherein a default value is defined as said attribute and the attribute value of said attribute matches said default value.

Claim 15 (Original): An XML data encoding system according to claim 11, wherein said means, for converting said ASN.1 abstract syntax value into said ASN.1 transfer syntax, employs the PER rules.

Claim 16 (Original): A system for decoding encoded XML data comprising:

means for converting a grammar definition for defining the grammar of XML data into ASN.1 abstract syntax type;

means for separating encoded XML data into an ASN.1 transfer syntax and the contents text of a compressed syntactic element;

means for converting said ASN.1 transfer syntax into an ASN.1 abstract syntax value that conforms to said ASN.1 abstract syntax type;

means for converting said ASN.1 abstract syntax value into an element name including the structure of XML data that conforms to said grammar definition;

means for decompressing said contents of said compressed syntactic element; and

means for combining the decompressed contents of said syntactic element and said structure of said XML data.

Claim 17 (Original): A system according to claim 16, wherein said grammar definition includes an attribute, a process instruction and a grammar definition entry other than said syntactic element,

further comprising:

means for converting said grammar definition into a different grammar definition, so that said grammar definition entry other than said syntactic element is included in said syntactic element as a special element; and

means for converting said decoded XML data into different XML data in conformation with said different grammar definition.

Claim 18 (Original): A system according to claim 16, wherein said grammar definition is a DTD, the element contents of which include operators selected from among: ",", "|", "?", "*" and "+", no operator, any combination of these operators; and wherein for said ASN.1 abstract syntax type, said "," operator is represented by a "sequence" type, said "|" operator is represented by a "choice" type, said "?" operator is represented by a combination of a "sequence" type and a keyword "OPTIONAL", said "*" operator is represented by a "sequence-of" type, said "+" operator is represented by a "sequence-of" type having a limited size, and a case wherein none of said operators is present is represented by a "defined" type.

Claim 19 (Original): A system according to claim 18, wherein said means, for converting said grammar definition into a different grammar definition, represents an attribute included in said grammar definition as an attribute element that can be uniquely determined, and handles said attribute as the child element of a parent element of said attribute; regards, as CDATA, the attribute value of said attribute and handles said attribute value as the child element of said attribute element; represents said attribute element by a syntactic element when said attribute is "REQUIRED"; and represents said attribute element by an element for which said "?" operator is employed when said attribute is "IMPLIED" and/or when a default value is defined as said attribute, and wherein said means, for converting said decoded XML data into different XML data, converts said attribute element, which is included as said child element in said syntactic element of said decoded XML data, into the attribute of said syntactic element and/or the attribute value thereof.

Claim 20 (Original): A system according to claim 16, wherein said means, for converting said ASN.1 transfer syntax into said ASN.1 abstract syntax value, employs the PER rules.

Claim 21 (Original): A method according to claim 4, further comprising excepting a case wherein a default value is defined as said attribute and the attribute value of said attribute matches said default value.

Claim 22 (Original): The method according to claim 6, wherein the structure is an element name including the structure.

Claim 23 (Original): An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing data encoding, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps of claim 1.

Claim 24 (Original): An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing data decoding, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps of claim 6.

Claim 25 (Original): A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for data encoding, said method steps comprising the steps of claim 1.

Claim 26 (Original): A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for data decoding, said method steps comprising the steps of claim 6.

Claim 27 (Original): A computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing data encoding, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect the functions of claim 11.

Claim 28 (Original): A computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing data encoding, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect the functions of claim 16.